What is claimed is:

1. A polarization mode dispersion compensation method in an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal, comprising:

sending said optical signal from said optical signal transmitter to said optical transmission path;

separating from said optical signal which is propagated along said optical transmission path, the polarization component which is parallel to, or the polarization component which is perpendicular to, the principal state of polarization of said optical transmission path;

compensating the group velocity dispersion at said polarization component which has thus been separated; and

receiving by said optical signal receiver said optical signal which has been compensated.

2. A polarization mode dispersion compensation method in an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal, comprising:

sending said optical signal from said optical signal transmitter to said optical transmission path;

separating from said optical signal which is propagated along said optical transmission path, the polarization component which is parallel to, and the polarization

component which is perpendicular to, the principal state of polarization of said optical transmission path;

compensating the group velocity dispersion of said one polarization component which has thus been separated; and

receiving by said optical signal receiver said optical signal which has been compensated.

3. A polarization mode dispersion compensation method in an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal, comprising:

outputting said optical signal from said optical signal transmitter;

receiving input of said optical signal, and converting said optical signal to circular polarization or to linear polarization;

sending said optical signal which has been thus converted to said optical transmission path;

a PMD medium which is connected to said optical transmission path is provided in advance at the signal reception side of said optical transmission path,

separating the PSP of said optical transmission path and said PMD medium from the optical signal which has been propagated through said optical transmission path and said PMD medium, said optical transmission path and said PMD medium are made so that the principal axes of polarization (PSP) of said optical transmission path and said PMD medium are linearly polarized or circularly polarized, and the polarization component which is parallel to, or the polarization component which is perpendicular to;

compensating the group velocity dispersion at said polarization component which has thus been separated; and

receiving by said optical signal receiver said optical signal which has been

compensated.

4. A polarization mode dispersion compensation method in an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal, comprising:

outputting said optical signal from said optical signal transmitter;

receiving input of said optical signal, and converting said optical signal is to circular polarization or to linear polarization;

sending said optical signal which has been thus converted to said optical transmission path;

a PMD medium which is connected to said optical transmission path is provided in advance at the signal reception side of said optical transmission path,

separating the principal axes of polarization (PSP) of said optical transmission path and said PMD medium from the optical signal which has been propagated through said optical transmission path and said PMD medium, said optical transmission path and said PMD medium are made so that the PSP of said optical transmission path and said PMD medium are linearly polarized or circularly polarized, and the polarization component which is parallel to, and the polarization component which is perpendicular to;

compensating the group velocity dispersion at said polarization component which has thus been separated; and

receiving by said optical signal receiver said optical signal which has been compensated.

5. A polarization mode dispersion compensation method according to any one of Claims 1 through 4, wherein said polarization component which has been separated

out from said optical signal is controlled so that, when said polarization component has been converted into an electrical signal, the ratio of a specified frequency component with respect to the DC component becomes a maximum, and is separated into a polarization component which is parallel to, and a polarization component which is perpendicular to, said principal state of polarization.

6. A polarization mode dispersion compensation method according to Claim 2 or 4, wherein the polarization component of said optical signal which is parallel to, and the polarization component of said optical signal which is perpendicular to, said principal state of polarization (PSP) of said optical transmission path are converted into respective electrical signals, are controlled so that the intensities of specified frequency components become equal to one another, and are separated into a polarization component which is parallel to, and a polarization component which is perpendicular to, said PSP.

7. A polarization mode dispersion compensation method according to Claim 2 or 4, wherein the polarization component of said optical signal which is parallel to, and the polarization component of said optical signal which is perpendicular to, said principal state of polarization (PSP) of said optical transmission path are controlled so that the phase difference between said two parallel polarization component and perpendicular polarization component which are parallel to one another becomes a maximum or a minimum, and are separated into a polarization component which is parallel to, and a polarization component which is perpendicular to, said PSP.

8. A polarization mode dispersion compensation method according to Claim 7, wherein the polarization component of said optical signal which is parallel to, and the polarization component of said optical signal which is perpendicular to, said principal state of polarization (PSP) of said optical transmission path are converted into respective electrical signals, are controlled, after the respective high frequency components have been eliminated, so that the phase difference between said two parallel polarization

component and perpendicular polarization component which are parallel to one another becomes a maximum or a minimum, and are separated into polarization components which are parallel to, or polarization components which are perpendicular to, said PSP.

9. A polarization mode dispersion compensation method according to Claim 7, wherein the polarization component of said optical signal which is parallel to, and the polarization component of said optical signal which is perpendicular to, said principal state of polarization (PSP) of said optical transmission path are controlled, after their respective signal patterns have been pattern converted according a specified rule, so that the phase difference between said two parallel polarization component and perpendicular polarization component which are parallel to one another becomes a maximum or a minimum, and are separated into polarization components which are parallel to, or polarization components which are perpendicular to, said PSP.

10. A polarization mode dispersion compensation method according to any one of Claims 1 through 4, wherein:

allocating specified codes from said optical signal transmitter to said optical signal and sending them;

receiving by said optical signal receiver said optical signal and detecting errors in said codes; and

controlling the polarization components which are separated from said optical signal which is propagated along said optical transmission path, so that the number of errors which are detected by said optical signal receiver becomes a minimum.

11. A polarization mode dispersion compensation method according to any one of Claims 1 through 4, wherein:

allocating specified error correction codes from said optical signal transmitter to said optical signal and sending them;

receiving by said optical signal receiver said optical signal and decoding said

error correction codes and correcting it; and

controlling the polarization components which are separated from said optical signal which is propagated along said optical transmission path, so that the number of errors which are corrected by said optical signal receiver becomes a minimum.

12. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a waveform deterioration detector which detects waveform deterioration of the polarization component which has been separated out by said polarizer;

a control device which controls said polarization controller so that the waveform deterioration which is detected by said waveform deterioration detector becomes a minimum; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

13. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a dispersion compensation module which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer;

a waveform deterioration detector which detects waveform deterioration of the polarization component which is outputted from said dispersion compensation module; and

a control device which controls said polarization controller and said dispersion compensation module so that the waveform deterioration which is detected by said waveform deterioration detector becomes a minimum.

14. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a principal state of polarization (PSP) detector which detects the PSP of said optical transmission path from the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a control device which controls said polarization controller so that the PSP which has been detected by said PSP detector agrees with the polarization state which is separated by said polarizer; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

15. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said DGD element;

a waveform deterioration detector which detects waveform deterioration of the polarization component which has been separated out by said polarizer;

a control device which controls said polarization controller so that the waveform deterioration which is detected by said waveform deterioration detector becomes a minimum; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

16. A polarization mode dispersion compensation device according to Claim 15, further comprising a polarization setting device that sets the polarization state of the

optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

17. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said DGD element;

a dispersion compensation module which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer;

a waveform deterioration detector which detects waveform deterioration of the optical signal which is outputted from said dispersion compensation module; and

a control device which controls said polarization controller and said dispersion compensation module so that the waveform deterioration which is detected by said waveform deterioration detector becomes a minimum.

18. A polarization mode dispersion compensation device according to Claim 17, further comprising a polarization setting device which sets the polarization state of the optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

19. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a principal state of polarization (PSP) detector which detects the PSP of said optical transmission path and of said DGD element said from the optical signal which is outputted from said DGD element;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a control device which controls said polarization controller so that the PSP which has been detected by said PSP detector agrees with the polarization state which is separated by said polarizer; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

20. A polarization mode dispersion compensation device according to Claim 19, further comprising a polarization setting device that sets the polarization state of the optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

21. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises an optical divider which divides the polarization components which have been separated by said polarization selection device, a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal, a specified frequency detector which detects a specified frequency component of the electrical signal which has been converted by said photoelectric conversion device, and a DC component detector which detects the DC compuonent of the electrical signal which has been converted by said photoelectric conversion device; and

said control device controls said polarization controller so that the ratio of said specified frequency component and said DC component becomes a maximum.

22. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises an optical divider which divides the polarization components which have been separated by said polarization selection device, a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into two, two recognition circuits which recognize and regenerate the electrical signals which have been divided out by said electrical signal divider, an agreement decision circuit which decides whether or not the logical values of said two signals which have been respectively outputted by said two recognition circuits agree with one another, and a low frequency pass circuit which detects the low frequency component of the output signal of said agreement decision circuit; and

said control device controls said polarization controller so that the output voltage of said low frequency pass circuit becomes a minimum.

23. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises an optical divider which divides the polarization components which have been separated by said polarization selection device, a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into two signals, two recognition circuits which recognize and regenerate the electrical signals which have thus been divided out by said electrical signal divider, an agreement decision circuit which decides whether or not the logical values of said two signals which have been respectively outputted by said two recognition circuits agree with one another, and a pulse number detection circuit which integrates the number of pulses in the output signal of said agreement decision circuit and outputs a voltage which is proportional to this pulse number; and

said control device controls said polarization controller so that the output voltage of said pulse number detection circuit becomes a minimum.

24. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises an optical divider which divides the polarization components which have been separated by said polarization selection device, a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into (2×n) signals, (2×n) recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said electrical signal divider, n agreement decision circuits which decide whether or not the logical values of two signals which have been respectively outputted by two of the recognition circuits which are selected from said (2×n) recognition circuits agree with one another, n low frequency pass circuits which detect the low frequency components of the output signals of said n agreement decision circuits, and an addition circuit which

adds together and outputs the output voltages of said n low frequency pass circuits; and

said control device controls said polarization controller so that the output voltage of said addition circuit becomes a minimum.

25. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises an optical divider which divides the polarization components which have been separated by said polarization selection device, a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into (2×n) signals, (2×n) recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said electrical signal divider, n agreement decision circuits which decide whether or not the logical values of two signals which have been respectively outputted by two of the recognition circuits which are selected from said (2×n) recognition circuits agree with one another, n pulse number detection circuits which integrate the numbers of pulses in the output signals of said n agreement decision circuits and output voltages which are proportional to these pulse numbers, and an addition circuit which adds together and outputs the output voltages of said n pulse number detection circuits; and

said control device controls said polarization controller so that the output voltage of said addition circuit becomes a minimum.

26. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises an optical divider which divides the polarization components which have been separated by said polarization selection device, a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal, a first electrical signal

divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into n signals, n recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said first electrical signal divider, a second electrical signal divider which divides the output signal of one recognition circuit which has been selected from said n recognition circuits into (n-1) signals, (n-1) agreement decision circuits which decide whether or not the logical values of the (n-1) output signals of those (n-1) recognition circuits other than said one recognition circuit which has been selected and the logical values of the (n-1) output signals of said second electrical divider respectively agree with one another, (n-1) low frequency pass circuits which detect the low frequency components of the output signals of said (n-1) agreement decision circuits, and an addition circuit which adds together and outputs the output voltages of said (n-1) low frequency pass circuits; and

said control device controls said polarization controller so that the output voltage of said addition circuit becomes a minimum.

27. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises an optical divider which divides the polarization components which have been separated by said polarization selection device, a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal, a first electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into n signals, n recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said first electrical signal divider, a second electrical signal divider which divides the output signal of one recognition circuit which has been selected from said n recognition circuits into (n-1) signals, (n-1) agreement decision circuits which decide whether or not the logical values of the (n-1) output signals of those (n-1) recognition circuits other than said one recognition circuit which has been selected and the logical values of the (n-1) output

signals of said second electrical divider respectively agree with one another, (n-1) pulse number detection circuits which integrate the number of pulses in the output signals of said (n-1) agreement decision circuits and output voltages which are proportional to these pulse numbers, and an addition circuit which adds together and outputs the output voltages of said (n-1) pulse number detection circuits; and

said control device controls said polarization controller so that the output voltage of said addition circuit becomes a minimum.

28. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises: an optical divider which divides the polarization components which have been separated by said polarization selection device; a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal; a first electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into (m×n) signals; m functional block groups, each of which consists of n recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said first electrical signal divider, a second electrical signal divider which divides the output signal of one recognition circuit which has been selected from said n recognition circuits into (n-1) signals, (n-1) agreement decision circuits which respectively decide whether or not the logical values of the output signals from those (n-1) recognition circuits other than said recognition circuit which has thus been selected and the logical values of the respective (n-1) output signals of said second electrical signal divider agree with one another, and (n-1) low frequency pass circuits which detect the low frequency components of the output signals of said (n-1) agreement decision circuits; and an addition circuit which adds together and outputs the (m×(n-1)) output voltages which are outputted from said functional block groups; and

said control device controls said polarization controller so that the output voltage of said addition circuit becomes a minimum.

29. A polarization mode dispersion compensation device according to any one of Claims 12, 13, 15, and 17, wherein:

said waveform deterioration detector comprises: an optical divider which divides the polarization components which have been separated by said polarization selection device; a photoelectric conversion device which converts one of the optical signals which have been divided by said optical divider into an electrical signal; a first electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into (m×n) signals; m functional block groups, each of which consists of n recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said first electrical signal divider, a second electrical signal divider which divides the output signal of one recognition circuit which has been selected from said n recognition circuits into (n-1) signals, (n-1) agreement decision circuits which respectively decide whether or not the logical values of the output signals from those (n-1) recognition circuits other than said recognition circuit which has thus been selected and the logical values of the respective (n-1) output signals of said second electrical signal divider agree with one another, and (n-1) pulse number detection circuits which integrate the numbers of pulses in the output signals of said (n-1) agreement decision circuits and output voltages proportional to said numbers of pulses; and an addition circuit which adds together and outputs the (m×(n-1)) output voltages which are outputted from said functional block groups; and

said control device controls said polarization controller so that the output voltage of said addition circuit becomes a minimum.

30. A polarization mode dispersion compensation device according to Claim 14 or 19, wherein:

said principal state of polarization (PSP) detector and said polarizer each comprises a polarization separation device which separates the optical signal which is outputted from said polarization controller into two polarization components which are

orthogonal to one another, an optical divider which divides one of the optical signals which are separated out by said polarization separation device, a first photoelectric conversion device which converts the other optical signal which is separated out by said polarization separation device into an electrical signal, a second photoelectric conversion device which converts one of the optical signals which are separated out by said optical divider into an electrical signal, a first specified frequency detector which detects a specified frequency component of the electrical signal which is converted by said first photoelectric conversion device, and a second specified frequency detector which detects a specified frequency component of the electrical signal which is converted by said second photoelectric conversion device; and

said control device controls said polarization controller so that the intensities of the two frequency components which are detected by said specified frequency detector become equal to one another.

31. A polarization mode dispersion compensation device according to Claim 14 or 19, wherein:

said principal state of polarization (PSP) detector and said polarizer each comprises a polarization separation device which separates the optical signal which is outputted from said polarization controller into two polarization components which are orthogonal to one another, an optical divider which divides one of the optical signals which are separated out by said polarization separation device, a first photoelectric conversion device which converts the other optical signal which is separated out by said polarization separation device into an electrical signal, a second photoelectric conversion device which converts one of the optical signals which are separated out by said optical divider into an electrical signal, and a phase comparison device which compares together the phase of the electrical signal which has been converted by said first photoelectric conversion device and the phase of the electrical signal which has been converted by said second photoelectric conversion device; and

said control device controls said polarization controller so that the phase

difference which is detected by said phase comparison device becomes a maximum or a minimum.

32. A polarization mode dispersion compensation device according to Claim 14 or 19, wherein:

said principal state of polarization (PSP) detector and said polarizer each comprises a polarization separation device which separates the optical signal which is outputted from said polarization controller into two polarization components which are orthogonal to one another, an optical divider which divides one of the optical signals which are separated out by said polarization separation device, a first photoelectric conversion device which converts the other optical signal which is separated out by said polarization separation device into an electrical signal, a first band restriction device which eliminates the high frequency component from the electrical signal which has been converted by said first photoelectric conversion device, a second photoelectric conversion device which converts one of the optical signals which are separated out by said optical divider into an electrical signal, a second band restriction device which eliminates the high frequency component from the electrical signal which has been converted by said second photoelectric conversion device, and a phase comparison device which compares together the phase of the electrical signal from which the high frequency component has been eliminated by said first band restriction device and the phase of the electrical signal from which the high frequency component has been eliminated by said second band restriction device; and

said control device controls said polarization controller so that the phase difference which is detected by said phase comparison device becomes a maximum or a minimum.

33. A polarization mode dispersion compensation device according to Claim 14 or 19, wherein:

said principal state of polarization (PSP) detector and said polarizer each

comprises a polarization separation device which separates the optical signal which is outputted from said polarization controller into two polarization components which are orthogonal to one another, an optical divider which divides one of the optical signals which are separated out by said polarization separation device, a first photoelectric conversion device which converts the other optical signal which is separated out by said polarization separation device into an electrical signal, a first signal processing device which performs pattern conversion upon the signal pattern of the electrical signal which has been converted by said first photoelectric conversion device according to a specified rule, a second photoelectric conversion device which converts one of the optical signals which are separated out by said optical divider into an electrical signal, a second signal processing device which performs pattern conversion upon the signal pattern of the electrical signal which has been converted by said second photoelectric conversion device according to a specified rule, and a phase comparison device which compares together the phase of the electrical signal upon which pattern conversion has been performed by said first signal processing device and the phase of the electrical signal upon which pattern conversion has been performed by said second signal processing device; and

said control device controls said polarization controller so that the phase difference which is detected by said phase comparison device becomes a maximum or a minimum.

34. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal

which has been outputted from said optical signal transmitter;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a control device which controls said polarization controller so that the number of code errors which is detected by said optical signal receiver becomes a minimum; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

35. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a dispersion compensation module which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer; and

a control device which controls said polarization controller and said dispersion compensation module so that the number of code errors which is detected by said optical signal receiver becomes a minimum.

36. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical

signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a control device which controls said polarization controller so that the number of errors which are corrected by said optical signal receiver becomes a minimum; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

37. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a dispersion compensation module which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer; and

a control device which controls said polarization controller and said dispersion compensation module so that the number of errors which are corrected by said optical

signal receiver becomes a minimum.

38. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a dispersion compensation module which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer; and wherein:

said optical signal receiver is endowed with a waveform deterioration detection function, and further comprises a control device which controls said polarization controller and said dispersion compensation module so that the waveform deterioration which is detected by said optical signal receiver becomes a minimum.

39. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal

which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a control device which controls said polarization controller so that the number of code errors which is detected by said optical signal receiver becomes a minimum; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

40. A polarization mode dispersion compensation device according to Claim 39, further comprising a polarization setting device which sets the polarization state of the optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

41. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said polarization controller;

a dispersion compensation module which compensates the group velocity

dispersion of the polarization component which has been separated out by said polarizer; and

a control device which controls said polarization controller and said dispersion compensation module so that the number of code errors which is detected by said optical signal receiver becomes a minimum.

42. A polarization mode dispersion compensation device according to Claim 41, further comprising a polarization setting device that sets the polarization state of the optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

43. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said DGD element;

a control device which controls said polarization controller so that the number of errors which are corrected by said optical signal receiver becomes a minimum; and

an automatic dispersion compensator which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer.

44. A polarization mode dispersion compensation device according to Claim 43, further comprising a polarization setting device that sets the polarization state of the optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

45. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said DGD element;

a dispersion compensation module which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer;

a control device which controls said polarization controller and said dispersion compensation module so that the number of errors which are corrected by said optical signal receiver becomes a minimum.

46. A polarization mode dispersion compensation device according to Claim 45, further comprising a polarization setting device which sets the polarization state of the optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

47. In an optical transmission system which comprises an optical signal transmitter which sends an optical signal, an optical transmission path which is connected to said optical signal transmitter and which transmits said optical signal, and an optical signal receiver which is connected to said optical signal transmitter via said optical transmission path and which receives said optical signal,

a polarization mode dispersion compensation device, provided upon said transmission path, and comprising:

a polarization controller which converts the polarization state of the optical signal which has been outputted from said optical signal transmitter;

a Differential Group Delay (DGD) element which allocates a PMD to the optical signal which is outputted from said polarization controller;

a polarizer which separates out a specified polarization component from the optical signal which is outputted from said DGD element; and

a dispersion compensation module which compensates the group velocity dispersion of the polarization component which has been separated out by said polarizer; and wherein:

said optical signal receiver is endowed with a waveform deterioration detection function, and further comprises a control device which controls said polarization controller and said dispersion compensation module so that the waveform deterioration which is detected by said optical detector becomes a minimum.

48. A polarization mode dispersion compensation device according to Claim 47, further comprising a polarization setting device which sets the polarization state of the optical signal which is outputted from said optical signal transmitter to circular polarization or to linear polarization.

49. A polarization mode dispersion compensation device according to Claim 38 or 47, wherein:

said optical signal receiver which is endowed with said waveform deterioration

detection function comprises a photoelectric conversion device which converts the optical signal into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into three signals, three recognition circuits which recognize and regenerate the three electrical signals which have thus been divided out by said electrical signal divider, an agreement decision circuit which decides whether or not the logical values of two of said recognition circuits which have been selected from said three recognition circuits agree with one another, and a low frequency pass circuit which detects the low frequency component of the output signal of said agreement decision circuit;

said control device controls said polarization controller and said dispersion compensation module so that the output voltage of said low frequency pass circuit becomes a minimum; and

the one said recognition circuit other than said two recognition circuits which have been selected outputs recognition data to the outside.

50. A polarization mode dispersion compensation device according to Claim 38 or 47, wherein:

said optical signal receiver which is endowed with said waveform deterioration detection function comprises a photoelectric conversion device which converts the optical signal into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into three signals, three recognition circuits which recognize and regenerate the three electrical signals which have thus been divided out by said electrical signal divider, an agreement decision circuit which decides whether or not the logical values of two of said recognition circuits which have been selected from said three recognition circuits agree with one another, and a pulse number detection circuit which integrates the number of pulses in the output signal of said agreement decision circuit and outputs a voltage proportional to said number of pulses;

said control device controls said polarization controller and said dispersion

compensation module so that the output voltage of said pulse number detection circuit becomes a minimum; and

the one said recognition circuit other than said two recognition circuits which have been selected outputs recognition data to the outside.

51. A polarization mode dispersion compensation device according to Claim 38 or 47, wherein:

said optical signal receiver which is endowed with said waveform deterioration detection function comprises a photoelectric conversion device which converts the optical signal into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into ((2×n)+1) signals, ((2×n)+1) recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said electrical signal divider, n agreement decision circuits which extract (2×n) of said recognition circuits from said ((2×n)+1) recognition circuits and decide whether or not the logical values of two signals which have been respectively outputted by two of the recognition circuits which are further selected from said (2×n) recognition circuits which have been extracted agree with one another, n low frequency pass circuits which detect the low frequency components of the output signals of said n agreement decision circuits, and an addition circuit which adds together and outputs the output voltages of said n low frequency pass circuits; and

said control device controls said polarization controller and said dispersion compensation module so that the output voltage of said addition circuit becomes a minimum; and

the one said recognition circuit other than said (2×n) recognition circuits which have been extracted outputs recognition data to the outside.

52. A polarization mode dispersion compensation device according to Claim 38 or 47, wherein:

said optical signal receiver which is endowed with said waveform deterioration detection function comprises a photoelectric conversion device which converts the optical signal into an electrical signal, an electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into ((2×n)+1) signals, ((2×n)+1) recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said electrical signal divider, n agreement decision circuits which extract (2×n) of said recognition circuits from said ((2×n)+1) recognition circuits and decide whether or not the logical values of two signals which have been respectively outputted by two of the recognition circuits which are further selected from said (2×n) recognition circuits which have been extracted agree with one another, n pulse number detection circuits which integrate the numbers of pulses in the output signals of said n agreement decision circuits and output voltages proportional to said numbers of pulses, and an addition circuit which adds together and outputs the output voltages of said n pulse number detection circuits; and

said control device controls said polarization controller and said dispersion compensation module so that the output voltage of said addition circuit becomes a minimum; and

the one said recognition circuit other than said (2×n) recognition circuits which have been extracted outputs recognition data to the outside.

53. A polarization mode dispersion compensation device according to Claim 38 or 47, wherein:

said optical signal receiver which is endowed with said waveform deterioration detection function comprises a photoelectric conversion device which converts the optical signal into an electrical signal, a first electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into n signals, n recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said first electrical signal divider, a second electrical signal divider which divides the output signal of a one of said recognition

circuits which has been selected from said n recognition circuits into n signals, (n-1) agreement decision circuits which decide whether or not the logical values of the output signals of the (n-1) recognition circuits other than said one recognition circuit which has thus been selected and the logical values of the (n-1) output signals which have been selected from said n output signals of said second electrical signal divider respectively agree with one another, (n-1) low frequency pass circuits which detect the low frequency components of the output signals of said (n-1) agreement decision circuits, and an addition circuit which adds together and outputs the output voltages of said (n-1) low frequency pass circuits;

said control device controls said polarization controller and said dispersion compensation module so that the output voltage of said addition circuit becomes a minimum; and

said second electrical signal divider outputs to the outside the one said output signal other than said (n-1) output signals which have been selected.

54. A polarization mode dispersion compensation device according to Claim 38 or 47, wherein:

said optical signal receiver which is endowed with said waveform deterioration detection function comprises a photoelectric conversion device which converts the optical signal into an electrical signal, a first electrical signal divider which divides the electrical signal which has thus been converted by said photoelectric conversion device into n signals, n recognition circuits which recognize and regenerate the respective electrical signals which have been divided out by said first electrical signal divider, a second electrical signal divider which divides the output signal of a one of said recognition circuits which has been selected from said n recognition circuits into n signals, (n-1) agreement decision circuits which decide whether or not the logical values of the output signals of the (n-1) recognition circuits other than said one recognition circuit which has thus been selected and the logical values of the (n-1) output signals which have been selected from said n output signals of said second electrical signal divider respectively

agree with one another, (n-1) pulse number detection circuits which integrate the numbers of pulses in the output signals of said (n-1) agreement decision circuits and output voltages proportional to said numbers of pulses, and an addition circuit which adds together and outputs the output voltages of said (n-1) pulse number detection circuits; and

said control device controls said polarization controller and said dispersion compensation module so that the output voltage of said addition circuit becomes a minimum; and

said second electrical signal divider outputs a further one output signal to the outside.

55. A polarization mode dispersion compensation device according to any one of Claims 12 through 54, wherein said optical signal transmitter outputs an optical signal to which has been allocated a return-to-zero format in which the phase of the light has been reversed for each bit.

56. A polarization mode dispersion compensation device according to any one of Claims 12 through 54, wherein said optical signal transmitter outputs an optical signal to which has been allocated a return-to-zero format in which the phase of the light has been reversed for each pulse.

57. A polarization mode dispersion compensation device according to any one of Claims 12, 14, 15, 19, 34, 36, 39, and 43, wherein said automatic dispersion compensator comprises:

a dispersion compensation module which compensates for dispersion in said optical signal which has been inputted;

a second waveform deterioration detector which is connected in series with said dispersion compensation module, and which detects waveform deterioration of the optical signal which has passed through said dispersion compensation module; and

a second control device which controls said dispersion compensation module so

that the waveform deterioration which has been detected by said second waveform deterioration detector becomes a minimum.

58. A polarization mode dispersion compensation device according to any one of Claims 12, 14, 15, 19, 34, 36, 39, and 43, wherein said automatic dispersion compensator comprises:

a dispersion compensation module which compensates for dispersion of said optical signal which has been inputted;

a dispersion detector which is connected in series with said dispersion compensation module, and which detects the cumulative dispersion value of the optical signal which has passed through said dispersion compensation module; and

a second control device which controls said dispersion compensation module so that said cumulative dispersion value which has been detected by said dispersion detector becomes zero.

59. A polarization mode dispersion compensation device according to Claim 58, wherein:

said optical signal transmitter sends an optical signal in which a plurality of wavelengths have been modulated with the same signal pattern; and

said dispersion detector comprises an optical separation device which separates the optical signal into a plurality of different wavelengths, a plurality of photoelectric conversion devices which convert said plurality of optical signals which have been separated out into respective electrical signals, and a phase comparison device which detects the phase differences between the electrical signals which have thus been converted by said photoelectric conversion devices.